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Results of Measures of α_1 and α_2 Centauri at Ascension Island.

Date.	Distance. "	No. of Obs.	Position Angle. °	′	No. of Obs.	Remarks.
1877·559	2·220	1				
·568	2·128	1	80	31	3	
·592	2·055	1	80	29	2	
·617	...	...	80	38	4	
·628	1·942	2	82	1	4	
·642	...	...	81	49	4	
·800	1·937	2		...		Measures made with great difficulty from unsteady air.
·827	1·863	1	99	41	2	
·841	1·760	3	94	36	3	
·876	1·806	1	99	54	2	
·901	1·438	1½	102	11	2	Definition very bad.

Thus, in hardly more than four months, we have evidence of a change of fully 0″·5 in distance and 20° in position angle. In connection with these measures, it is interesting to hear from Mr. Ellery (*The Observatory* for August 1868) that, from observations on May 8 of the present year, the components are now separating. Obviously, then, the above measures have been made during a critical and important epoch in the orbit. I only regret that much other work prevented my making more numerous measures, including some on artificial stars.

Additions to Memoir on the Theory of the Sidereal System.

By Maxwell Hall, Esq.

There are a few more stars to be added to the lists given in the Memoir on this subject, vol. xliii. of the *Memoirs*, and there are several Notes to be made respecting stars already discussed. These additions are for the most part satisfactory, and confirm the Theory as formerly explained.

It may be remembered that the Sun and the nearer stars were assumed to revolve in circular orbits about their common centre of gravity, a point in space whose position was found to be—

$$\left.\begin{array}{lrr} & ° & \\ \text{R.A.} & 9 & 15 \\ \text{N.P.D.} & 63 & 28 \end{array}\right\} \text{1850, Jan. 1·0,}$$

and whose distance is 31 million times the distance of the Earth

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from the Sun; that by means of these data, which were obtained by combining the direction of the Sun's motion through space with the proper motions and distances of *α Centauri*, 61 *Cygni*, and *Sirius*, the parallaxes and radial velocities of several other stars were computed from their observed proper motions; that the results of the comparison between observation and theory were highly satisfactory in several cases; but that for a few stars the results were decidedly wrong.

This peculiarity still exists, and four of the stars considered give erroneous results, possibly due to the assumed circularity of their orbits.

The following Table contains all the stars whose parallaxes have been found by observation; they are 23 in number; and the differences between observation and computation are exhibited as clearly as possible. The radial velocities are expressed in terms of mean radii of the Earth's orbit per annum; in order to express these velocities in miles per second, they must be multiplied by 2·9.

Star.	M.	Annual Parallax. Obs.	Comp.	O–C.	Radial Velocity. Obs.	Comp.	O–C.
		"	"	"			
α Centauri	0·6	0·936	0·936	0·000			
61 Cygni	5·5	0·438	0·422	+0·016			
Sirius	0·1	0·204	0·210	–0·006			
Arcturus	0·8	0·133	0·188	–0·055	–15·4	–14·5	–0·9
Vega	1·0	0·098	0·069	+0·029	–15·9	–17·5	+1·6
Procyon	1·0	0·123	0·074	+0·049	+ 9·7	+ 8·6	+1·1
Capella	1·0	0·046	0·029	+0·017	+ 9·7	+ 8·7	+1·0
Altair	1·3	0·181	0·146	+0·035	–13·3	–14·1	+0·8
70 *p* Ophiuchi	4·5	0·160	0·099	+0·061			
34 Groombridge	8·0	0·307	0·195	+0·112			
Polaris	2·3	0·068	0·008	+0·060			
85 Pegasi	6·0	0·050	0·071	–0·021			
3077 Bradley	6·0	0·070	0·104	–0·034			
η Cassiopeiæ	4·0	0·154	0·065	+0·089			
μ Cassiopeiæ	5·5	0·342	0·199	+0·143			
γ Draconis	2·6	0·092	0·007	+0·085			
3 Centauri	1·2	?	0·001	...			
21185 Lalande	7·5	0·501	0·753	–0·252			
Ursæ Majoris	3·5	0·133	?	...			
1830 Groombridge	6·5	?	2·682	...			
r Draconis	5·0	0·255	1·963	...			
17415 Oeltzen	9·0	0·247	neg.	...			
21258 Lalande	8·5	0·260	neg.	...			

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It will be seen that out of these 23 stars there are two whose computed parallaxes are far too large, and that there are two whose parallaxes are negative; but on the other hand the close agreement between the observed and computed parallaxes and radial velocities of *Arcturus*, *Vega*, *Procyon*, *Capella*, and *Altair* excludes the possibility of such agreement being due to chance; and in forming equations of condition for the more accurate determination of the constants of the system it will be advisable to reject the discordances, and to give great weight to the agreements in both parallax and radial velocity.

But the time has not yet arrived for this redetermination; only six stars out of the 23 have been observed with the spectroscope; and although many of the stars are very small, others are large enough, as *Polaris*, γ *Draconis*, α and β *Centauri*, and a few more.

With regard to those stars which have been observed with the spectroscope, but whose parallaxes are as yet unknown, it might seem proper to compute their parallaxes and radial velocities for the sake of the comparison of the latter; but many of these stars have very small and therefore uncertain proper motions, and the few examples given in the memoir show that no great advance would be made. And indeed it will be better to delay all extensive calculations until the constants have been more accurately ascertained.

The following notes and computations refer to the details of the alterations and additions comprised in the above Table; they will be found useful in the reconstruction of the system.

α *Centauri.*

A valuable paper by Mr. Stone on the proper motions of southern stars will be found in vol. xlii. of the *Memoirs*, where the following are given for this star:—

P.M. in R.A. $= -0^{s}{\cdot}485$
P.M. in N.P.D. $= -0''{\cdot}75$.

As these proper motions agree very closely with those adopted in the Memoir, page 168, no recomputation was considered necessary for the present; but, for the future, the proper motions given by Mr. Stone should be employed.

61 *Cygni.*

In the *Observatory* for September 1878 Dr. Ball discusses a series of observations for parallax and finds 0″·465. This is very satisfactory, and confirms the adopted value of 0″·422. Dr. Ball also gives seven other determinations; if we include his own and take the mean of the eight, we shall find 0″·438 as the probable parallax of this star.

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Sirius.

The parallax of 0″·193 ascribed to this star by Professor Gylden has been generally adopted since the Memoir was written. We have therefore for this star

	″
Henderson, corrected by Peters	0·15
Abbe	0·27
Gylden	0·193
Mean	0·204

The radial velocity found by Dr. Huggins has been confirmed at Greenwich very recently. By giving the weights indicated in the Greenwich Table of "Motions of Stars in the Line of Sight," *Monthly Notices*, vol. xxxviii., p. 507, the radial velocity observed is +7·9; Dr. Huggins found +6·9; but as no correction can yet be made for the binary motion of *Sirius*, its radial velocity has been omitted in the above Table.

Arcturus.

The parallax of 0″·127 found by Peters was confirmed by the parallax of 0″·138 found by Johnson, *Monthly Notices*, vol. xvii., p. 271; a mean parallax of 0″·133 should be adopted.

Again, the recent observations at Greenwich give a radial velocity of −11·7; Dr. Huggins found −19·0; and the mean, −15·4, agrees very closely with the theoretical radial velocity of −14·5.

Vega.

It was shown that the probable value of the observed parallax was about 0″·09; and this is confirmed by Johnson' parallax of 0″·08, and by Brünnow's recent determination of 0″·13; a mean parallax of 0″·098 should be adopted.

For the radial velocity we have

Dr. Huggins	−17·0
Dr. Vogel	−17·9
At Greenwich	−12·8
Mean	−15·9

The theoretical value is −17·5.

Procyon.

A radial velocity of +9·7 has been observed at Greenwich; the theoretical velocity of +8·6 has therefore been confirmed.

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Capella.

As for *Procyon*, a radial velocity of +9·7 has been observed at Greenwich; the theoretical velocity of +8·7 has therefore been confirmed.

Polaris.

A parallax of 0″·091 was adopted in *Nature*, 1876, November 23; and in the same periodical Professor Gylden adopted a parallax of 0″·046, 1878, October 24. And as Peters found 0″·067, the most probable value of the parallax is 0″·068.

It is to be regretted that *Polaris* has not yet been observed with the spectroscope for velocity in the line of sight.

85 *Pegasi.*

A parallax of 0″·05 has been found by Dr. Brünnow for this star; the proper motions used in the computations were taken from the B.A.C.

3077 *Bradley.*

A parallax of 0″·07 has been found by Dr. Brünnow for this star; the proper motions used in the computations were taken from the B.A.C.

η *Cassiopeiæ.*

A parallax of 0″·154 was assigned to this star in *Nature*; the proper motions used in the computations were found by Main.

μ *Cassiopeiæ.*

A parallax of 0″·342 has been found by Professor O. Struve; the proper motions, which are very large, have been taken from Main's paper.

γ *Draconis.*

The observations made at Greenwich gave a negative parallax to this star; a parallax of 0″·092 is given in *Nature*, Chambers's *Descriptive Astronomy*, and elsewhere. Main's proper motions have been employed; they are very small.

β *Centauri.*

In vol. xxi. of the *Memoirs* there is an elaborate discussion of the parallax of this star by Maclear, who reduced the whole series of observations in N.P.D. to the equation

$$\pi = 0''{\cdot}4817 + 0{\cdot}3987\,\mu,$$

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where π is the annual parallax of the star and μ its proper motion in N.P.D., both expressed in seconds of arc.

Maclear found $\mu = +0''\cdot064$ at the commencement of that memoir; but afterwards he adopted $-0''\cdot03$ with no obvious reason, and so deduced a parallax of $0''\cdot47$; at the same time the constant of aberration became $20''\cdot59$.

This determination is unsatisfactory, and the star was not considered in the Memoir on the sidereal system; but as the parallax of $0''\cdot47$ has been adopted by two or three writers, it becomes necessary to include this star.

The proper motions according to Mr. Stone are $-0^s\cdot010$ in R.A. and $+0''\cdot05$ in N.P.D.; and by employing this value of μ, π becomes $0''\cdot502$; the computed parallax is insensible.

21185 *Lalande.*

A parallax of $0''\cdot501$ has been found for this star by Winnecke. The proper motions given by Lynn are $-0^s\cdot044$ in R.A. and $+4''\cdot66$ in N.P.D.

17415 *Oeltzen.*

This star gave a negative parallax, and I threw considerable doubt upon my own work because, in the *Astronomical Register*, vol. xiii., p. 272, it is referred to as 7515 Oeltzen, and a misprint seemed improbable. I have to thank Dr. Krüger for sending me a reprint of his article on the determination of the parallax of this star, which was published in the *Acta Soc. Scien. Fennicæ*, *t.* vii.

The star is Nos. 17415, 6 Oeltzen; and no alteration can be made at present in the former computations.

21258 *Lalande.*

An unfortunate mistake has occurred with respect to this star. Mr. Lynn confirmed the proper motions found by Professor Argelander, and in the *Monthly Notices*, vol. xxxiii., p. 102, he gave $-0^s\cdot386$ in R.A. and $-1''\cdot36$ in N.P.D. This was in December 1872; early in the year 1873, when I was abroad, I adopted his determinations as recorded in the *Astronomical Register*, vol. xi., p. 5, where the negative sign was unfortunately omitted before the proper motion in N.P.D. Consequently it was assumed that the proper motion was positive, and it is not a little remarkable that the erroneous computations gave a correct value of the annual parallax, while the correct computations give a negative parallax, which can only be considered as erroneous in the present state of the theory

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No.	Star.	M.	R.A. h m s	P.M. in R.A. s	N.P.D. ° ′	P.M. in N.P.D. ″
1	85 Pegasi	6·0	23 54 21	+0·067	63 43	+0·95
2	3077 Bradley	6·0	23 6 4	+0·201	33 40	−0·28
3	η Cassiopeiæ	4·0	0 40 3	+0·132	32 59	+0·49
4	μ Cassiopeiæ	5·5	0 58 19	+0·386	35 49	+1·56
5	γ Draconis	2·6	17 53 8	0·000	38 29	+0·04
6	β Centauri	1·2	13 53 17	−0·010	149 39	+0·05
7	21185 Lalande	7·5	10 55 8	−0·044	53 2	+4·66
8	21258 Lalande	8·5	10 58 0	−0·386	45 42	−1·36

No.	log l	log m	log n	log δl	log δm	log δn
1	+9·95248	−8·34571	+9·64622	+ 9·64621	+ 9·94959	− 9·93033
2	+9·73165	−9·11145	+9·92027	+ 9·21245	+10·22531	+ 9·19095
3	+9·72924	+8·97630	+9·92367	+ 9·33646	+10·05423	− 9·42611
4	+9·75308	+9·16833	+9·90896	+ 9·56937	+10·55606	− 9·96042
5	−8·27049	−9·79380	+9·89364	− 6·97220	− 8·49551	− 8·39605
6	−9·64818	−9·37962	−9·93599	+ 7·30750	+ 8·94047	− 8·40250
7	−9·88491	+9·34856	+9·77913	−10·18865	+10·11025	−10·57093
8	−9·83864	+9·28163	+9·84411	+10·30600	+10·57276	+ 9·98827

No.	log a	b	c^2	H	K	log $(H+\Pi\rho_o)$	log $(K+a\Pi V)$
1	+9·12070	−1·267	1·714	−0·9861	−0·139	− 9·95075	− 9·11394
2	+9·68843	−1·314	2·873	− ·8292	−0·455	− 9·88395	− 9·62634
3	+9·48940	−1·108	1·402	− ·8617	−0·236	− 9·88047	− 9·33445
4	+9·39005	−3·509	13·917	− ·8835	−0·438	− 9·92952	− 9·62531
5	+9·97598	+0·012	0·002	− ·2436	+0·016	+ 9·84905	+ 8·89763
6	−9·33546	−0·086	0·008	+ ·8127	−0·003	+10·73832	− 8·23045
7	+9·41984	−2·893	17·909	+ ·3768	+2·841	+ 9·58614	+10·45606
8	+9·52035	−2·821	19·020	+ ·2696	−2·759	...	−10·43727

No.	log u	$H\Pi V$	log $\left\{ \begin{matrix} au-b \\ +H\Pi V \end{matrix} \right\}$	log ϖ	ϖ ″	ρ_o	$\frac{d\rho}{dt}$
1	+ 9·16319	−0·065	+10·08672	8·85303	0·071	14·03	− 2·04
2	+ 9·74239	− ·055	+10·18441	9·01865	0·104	9·58	− 5·29
3	+ 9·45398	− ·057	+10·05652	8·81490	0·065	15·31	− 4·36
4	+ 9·69579	− ·058	+10·55303	9·29945	0·199	5·02	− 2·49
5	+ 9·04858	− ·016	+ 8·89209	7·85075	0·007	141·01	−15·77
6	− 7·49213	+ ·054	+ 9·14922	7·15429	0·001	700·99	+ 2·18
7	+10·86992	+ ·025	+10·68726	9·87656	0·753	1·33	− 9·85
8	...	+ ·018	...	...	...	...	...

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Errata in Memoir, vol. xliii.

Page 168, last line. For "$0''\cdot78$" read "$-0''\cdot78$."

„ 176, equation (10). For "$2\mathrm{V}\,\{au-b+\mathrm{H}\Pi\mathrm{V}\,(1-\Lambda\}$"
read "$2\mathrm{V}\,\{au-b+\mathrm{H}\Pi\mathrm{V}\,(1-\Lambda)\}$."

„ 179, line 4. For "$\frac{d\rho}{d}$" read "$\frac{d\rho}{dt}$."

„ 185, line 20. For "south, preceding" read "south-preceding."

„ 191, line 3. For "$0''\cdot223$" read "$0''\cdot023$."

And in Tables &c., *dele* Star No. 10 and substitute from the Tables in the present article Star No. 8.

Reduction of the North Polar Distances of the Cape Catalogue for 1860 *to Auwers' Standard.* By A. W. Downing, B.A., T.C.D.

When comparing Catalogues together for such purposes as the determination of proper motions, it is of course necessary, where extreme accuracy is desired, to reduce the places of stars given in the different Catalogues to a uniform standard, so that the discordances peculiar to each individual Catalogue may be thus eliminated. The standard usually adopted for North Polar Distances is that given by Dr. Auwers in No. 1536 of the *Astronomische Nachrichten*, and in the present paper I have investigated the corrections which it is necessary to apply to the N.P.D.'s of the Cape Catalogue for 1860 to reduce them to this standard.

The Cape Catalogue has first been compared with the Greenwich Seven-Year Catalogue for 1860. There are 385 stars common to the Catalogues which are available for the purpose, after rejecting those whose places in either Catalogue depends on a single observation, and also two other stars, one passing the meridian very near the horizon of the Cape, and whose N.P.D. in the Cape Catalogue depends on only two observations, the other passing the meridian very near the horizon of Greenwich, the place in the Greenwich Catalogue depending on the same limited number of observations. These 385 stars have been arranged in order of N.P.D. and have then been taken in groups, each embracing about 5° of N.P.D., and, by taking the means of the N.P.D.'s and of the differences between the Catalogues for each group, I get 16 sets of mean differences extending from N.P.D. 49° 51′ to 124° 34′. These differences have been laid down and a curve drawn through the points which may be taken as representing the systematic differences between the Catalogues. The following Table gives the differences as computed and as read off from the curve.